EN200

LAB #9

WELDING AND SHIP STRUCTURES LAB

Instructions

1. This lab is **conducted in various locations** on the lab deck of Rickover Hall.

2. You will need to **bring this lab to the lab period**.

3. The lab consists of a number of different demonstrations - each aiming to reinforce a different aspect of ship structures. There are questions relevant to each demonstration.

4. The lab is to be performed and submitted individually. You can ask questions and discuss the content of the lab, but the **submitted work must be your own**.

5. **All work must be shown on your lab for proper credit.** This means that you must show generalized equations, substitution of numbers, units and final answers. Engineering is communication. Other people should be able to understand your work.

6. **This lab is to be submitted at the end of the lab period**.

7. There should be sufficient work to last the entire 1 hour and 50 minutes of this lab. If you do finish early then check your work. If you get less than 100% you have done yourself an injustice by finishing early.

Student Information:

Name: _____

Section: _____

Date: _____

Aim:

- Introduce the student to the different welding and joining techniques currently available.
- Describe the safety procedures applicable to different welding techniques.
- Reinforce the students understanding of the principle ship structural loads.
- Describe, name and give the purpose of the different elements of a ships structure.

Part 1: Welding and Joining Techniques

General Welding Questions

1. For a fusion welding process to be successful, what can be said about the melting points of the 2 metals being joined?

   _____

2. Why is it important to protect the weld from the atmosphere while it is in its molten state?

   _____

3. In a successful weld, how does the strength of the weld compare with that of the parent metal?

   _____

4. What is the Heat Affected Zone (HAZ)? _____

   _____

5. How does the strength of the HAZ compare with that of the parent metal? _____

   _____

6. What will happen to the properties of a weld if it is cooled too quickly?_____

   _____

Shielded Metal Arc Welding (Stick Welding)

7. In stick welding, what provides the heat to create the weld? _____

8. Where does the filler metal come from? _____

9. What provides the barrier between the weld and the atmosphere? _____

_____

Where does it come from? _____

MIG Welding

10. What does MIG stand for? _____

11. In MIG welding, what provides the heat to create the weld?_____

12. Where does the filler metal come from? _____

13. What provides the barrier between the weld and the atmosphere? _____

TIG Welding

14. What does TIG stand for? _____

15. In TIG welding, what provides the heat to create the weld? _____

16. Where does the filler metal come from? _____

17. What provides the barrier between the weld and the atmosphere? _____

Oxyacetylene Welding

18. In Oxyacetylene welding, what provides the heat to create the weld? _____

_____

19. Where does the filler metal come from? _____

20. What provides the barrier between the weld and the atmosphere? _____

Welding Safety

21. Give 3 safety requirements for the performance of any fusion welding technique.

- Requirement 1: _____

Why? _____

- Requirement 2: _____

Why? _____

- Requirement 3: _____

Why? _____

22. Give 2 safety requirements for the transportation of oxyacetylene welding equipment.

- Requirement 1: _____

Why? _____

- Requirement 2: _____

Why? _____

Brazing and Soldering

23. In a brazing or soldering operation what is the purpose of the flux? _____

_____

24. Give 2 advantages brazing and soldering has over fusion welding.

- Advantage 1 _____
- Advantage 2 _____

25. What disadvantage does a brazed or soldered joint have over a welded joint.

- Disadvantage _____

Part 2: Floating Block Demonstration

Shear stress

1. In the box below, draw a profile view of the floating blocks and the location of the weights when the instructor was showing the floating blocks being subjected to vertical shear stress. Label the waterline, and show where shear stress is being indicated.

2. A more realistic loading pattern for a box shaped barge is displayed below at Figure 1. On the Figure sketch the buoyant force distribution that would maintain the barge at static equilibrium.

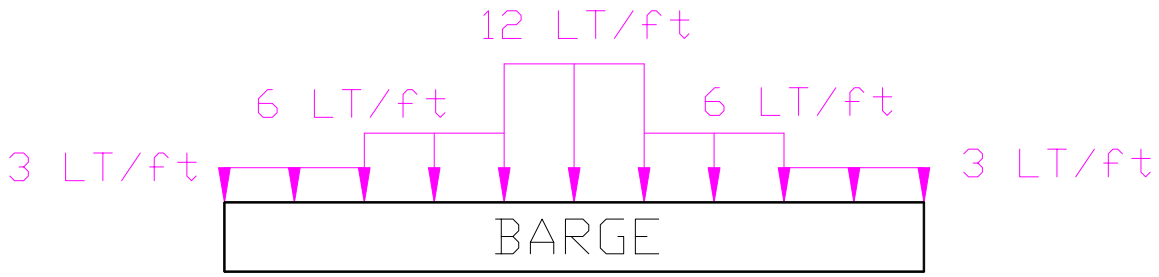


Figure 1 Realistic Loading Pattern on a Box Shaped Barge

3. In the space below, sketch the net load diagram of the barge shown in Figure 1.

4. On a regularly shaped ship, the points of maximum shear are located at approximately the ¼ and ¾ points down the length of the ship.

5. What could be done to the structure of the ship to reduce the shear stress at these points?

_____

Longitudinal Bending

6. In the box below, draw a profile view of the floating blocks and the location of the weights when the instructor was showing the floating blocks being subjected to Hogging. Label the waterline, and show where tensile stress and compressive stress is being indicated.

7. In the box below, draw a profile view of the floating blocks and the location of the weights when the instructor was showing the floating blocks being subjected to Sagging. Label the waterline, and show where tensile stress and compressive stress is being indicated.

8. Using the axial flexure formula, show how the bending stress alters from the keel to the weatherdeck for a vessel in a hogging and sagging condition.

$$Bending\ Stress = \frac{My}{I}$$

Hogging	**Sagging**

9. Bending stress is usually at a maximum at midships. What can be done to the structure of a vessel to minimize the bending stress at midships?_____

_____

Part 3: Walking Tour of Structures Lab and Model Room

Structures Lab

1. In the box below show the primary load path taken by hydrostatic pressure through the structure of a ship?

2. What is the failure mode of the panel shown by your instructor? _____

   What is the probable cause of this failure? _____

3. In the box below, sketch the panel and show where stress would be concentrated.

4. What failure mode could be created by these stress concentrations? _____

   How could the failure mode be avoided? _____

   _____

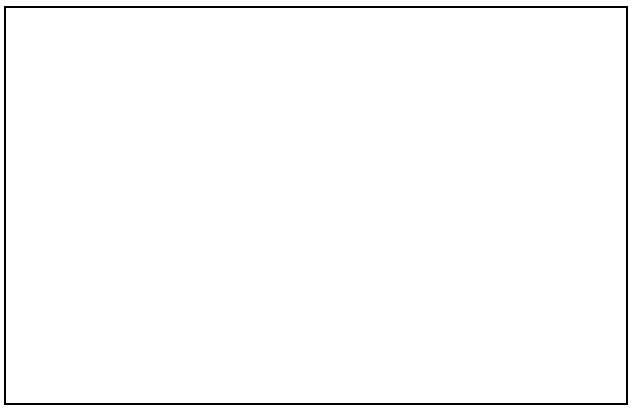
5. What failure mode could be created in the panel by low temperatures? _____

   Where would this failure mode probably occur? _____

Model Room

6. Sketch a section of a ship in the box below. On your sketch draw and label the following elements of ship structure.

- Keel
- Longitudinals
- Stringers
- Deck Girders
- Shear Strake



7. What is the purpose of these structural elements? _____

_____

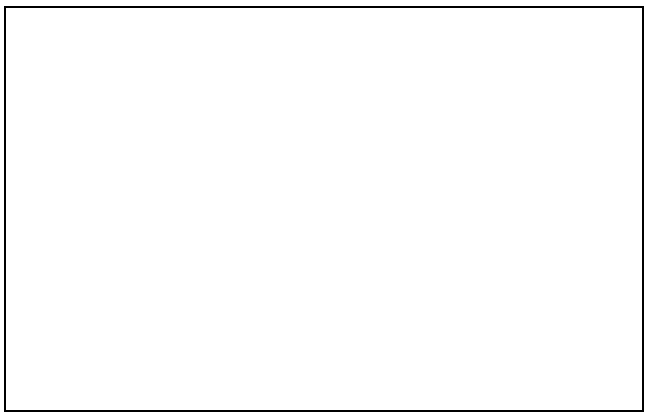
8. Which of these structural elements is likely to have the smallest cross sectional area?

_____

Why ? _____

9. In the box below sketch a 3-Dimensional perspective of a central portion of a ship. Draw and label the following structural elements.

- Web Frame
- Frame
- Stanchion



10. What is the purpose of Web frames and frames? _____

11. What is the purpose of stanchions? _____